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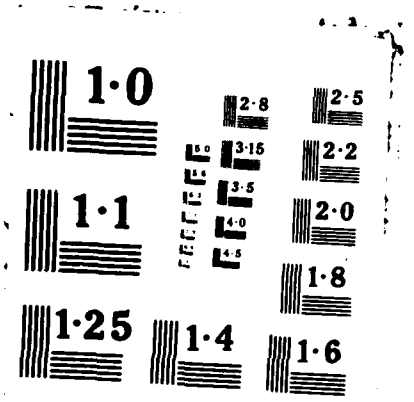
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IMPROVING CONSTRUCTION: THE CII RECOMMENDATIONS

Report AL701

August 1987

William B. Moore
Trevor L. Neve

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A decrease in construction industry productivity over the past 20 years led the Business Roundtable to establish the Construction Industry Cost Effectiveness (CICE) Project and the Construction Industry Institute (CII) to address its problems and propose solutions to them. Many of their ideas have led to substantial cost savings. Some CICE and CII recommendations have general applicability to DoD. Although DoD is a member of CII and represented on numerous CII task forces, personnel at the field operating activities have little knowledge of the CICE or CII recommendations. We provide several recommendations designed to help DoD achieve the maximum benefits from the CII study results and recommendations.

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Executive Summary

IMPROVING CONSTRUCTION: THE CII RECOMMENDATIONS

Productivity in the U.S. construction industry has declined precipitously since 1965. The Business Roundtable, concerned by this trend, established the Construction Industry Cost Effectiveness (CICE) Project to examine and propose solutions to construction industry problems. The CICE Project led to the establishment of the Construction Industry Institute (CII) in 1983 as a permanent center for the study and improvement of construction management.

The Director, Quality Facilities Acquisition (QFA), Office of the Deputy Assistant Secretary of Defense (Installations) wants the DoD to maximize the benefits from its CII membership.

We see opportunities for improvement. CII task force studies and recommendations are primarily directed at the private sector. Many, however, have applicability to DoD. We find that field personnel in DoD construction organizations have little or no knowledge of CII recommendations despite Service representation on CII task forces.

The DoD needs ways to capture the benefits of CII recommendations for its design and construction program. We recommend, therefore, that the Director, QFA, take the following actions in conjunction with the Services:

- Require each DoD representative on CII task forces to review the applicability of recommendations to DoD with the Defense Military Construction Panel at the completion of task force studies.
- Send synopses of task-force recommendations prepared by task force representatives to the Commanders of Naval Facilities Engineering Command (NAVFAC) and U.S. Army Corps of Engineers (USACE) and the Director of Air Force Engineering and Services.

- Arrange for CII reports to be sent directly to NAVFAC Engineering Field Divisions, USACE Districts and Divisions, and Air Force Regional Civil Engineers offices.

We believe such actions will help DoD become more knowledgeable about CII study results and recommendations at minimum expense and effort.

CONTENTS

CHAPTER 1

BACKGROUND – CII TASK FORCES

BACKGROUND

The construction industry in the United States has historically accounted for approximately 10 percent of the gross national product (GNP). Since 1965, however, its GNP share has steadily dropped and is now less than 6 percent. Construction industry productivity has also exhibited disturbing trends. The American Productivity Center in Houston has measured labor productivity in 11 major industries for over 3 decades and found construction to be the worst performer by a wide margin. Since 1965, it has been the only industry with a consistently negative productivity growth. In 1981, the Department of Commerce reported that construction productivity had declined 17.1 percent between 1972 and 1979.

In response to the construction industry declines, the Business Roundtable organized the Construction Industry Cost Effectiveness (CICE) Project in 1979. For the next 4 years, the CICE task forces examined productivity and cost issues in the construction industry and issued 23 reports with recommendations for improving its efficiency and effectiveness. The reports represent the thinking of a cross section of individuals from the construction industry – contractors, owners, and universities with construction management programs. A listing of the CICE reports is presented in Table 1-1.

A major outcome of the CICE Project was the establishment of the Construction Industry Institute (CII), a center for furthering the study of construction management. Organized in 1983 at the University of Texas at Austin, the CII is made up of a full-time staff and numerous corporate and governmental members including DoD. The first action of the CII was to evaluate the impacts and benefits of the CICE Project.

IMPACT OF CICE PROJECT

In early 1984, CII formed the CICE Impact Evaluation Task Force to "evaluate the impact of the CICE Project with regard to increasing the efficiency of the

TABLE 1-1

CONSTRUCTION INDUSTRY COST EFFECTIVENESS PROJECT REPORTS

PROJECT MANAGEMENT – Study Area A

A-1 Measuring Productivity in Construction
A-2 Construction Labor Motivation
A-3 Improving Construction Safety Performance
A-4 First and Second Level Supervisory Training
A-5 Management Education and Academic Relations
A-6 Modern Management Systems
A-7 Contractual Arrangements

CONSTRUCTION TECHNOLOGY – Study Area B

B-1 Integrating Construction Resources and Technology into Engineering
B-2 Technological Progress in the Construction Industry
B-3 Construction Technology Needs and Priorities

LABOR EFFECTIVENESS – Study Area C

C-1 Exclusive Jurisdiction in Construction
C-2 Scheduled Overtime Effect on Construction Projects
C-3 Contractor Supervision in Unionized Construction
C-4 Constraints Imposed by Collective Bargaining Agreements
C-5 Local Labor Practices
C-6 Absenteeism and Turnover
C-7 The Impact of Local Union Politics

LABOR SUPPLY and TRAINING – Study Area D

D-1 Subjourneymen in Union Construction
D-2 Government Limitations on Training Innovations
D-3 Construction Training Through Vocational Education
D-4 Training Problems in Open Shop Construction
D-5 Labor Supply Information

REGULATIONS and CODES – Study Area E

E-1 Administration and Enforcement of Building Codes and Regulations

construction industry." The Task Force was divided into three study teams to examine the exposure, awareness, and implementation of the CICE studies. The exposure study team evaluated the extent to which companies and individuals knew of the CICE Project. It found that approximately 1 million copies of the reports had been requested and distributed, primarily to large owners and contractors – nearly

80 percent of the 223 CICE report recommendations applied to them. The awareness study team also examined the industry's level of knowledge about CICE report findings. In a random sample survey, it found that 36 percent of the respondents were aware of the CICE Project and that 20 percent were implementing some of the project's recommendations. The implementation study team concentrated on evaluating attempts to implement the 223 CICE recommendations and identifying the benefits that have been achieved. Thirty-eight implementation programs from 15 owners, 18 contractors, and 5 associations were evaluated. Companies in the owners category were all leaders in the manufacturing, petrochemical, and power industries. The contractors submitting programs were all in the *Engineering News Record's* Top 400 Contractors. The associations included national contractor associations, local user groups, and professional societies.

The implementation study team found that significant cost savings are possible when CICE recommendations are implemented. An average cost reduction of more than 10 percent was documented. On those same projects, the ratio of the achieved benefits to the costs for implementation was greater than 10 to 1. Thirteen of fifteen of these cost saving ideas were recommendations addressing productivity improvement, constructibility, or safety, with safety ideas and recommendations, by far, the most frequently implemented.

Other important recommendations that were implemented dealt with labor relations, training, and project management. The priority of concerns differed slightly between owners and contractors on secondary issues, but both groups rated the implementation of a safety program as a top priority.

A key finding was that exposure to the CICE reports was the single most important factor that influenced the impact of the CICE studies. Members of the construction industry who are exposed to the ideas and recommendations of the CICE Project are highly likely to adopt some of the recommendations and realize their benefits. While every CICE idea may not be appropriate for every owner or contractor, few of those ideas fail to reach some part of the community. Consequently, it is critical that the reports be well disseminated if the ideas and recommendations they contain are to have any significant impact on the construction industry.

CII TASK FORCES

The CII has established 14 task forces to examine construction industry problems and recommend solutions and improvements in the following areas:

1. Productivity Measurements
2. Model Plant
3. Constructability
4. Data
5. Contracts
6. Cost/Schedule Controls
7. Materials Management
8. Design
9. Technology
10. Quality Management
11. Employee Effectiveness
12. Project Organization
13. Safety
14. Education and Training

The DoD has representatives on six of these task forces, listed in Appendix A. By early 1987, the CII task forces have issued seven reports. Although CII task forces are primarily directed at the private sector, most of their reports have general applicability to DoD. Two reports should be of immediate interest to DoD construction and design managers. Publication 3-1 highlights the benefits of performing constructability reviews, and Publication 8-1 presents a method for evaluating design effectiveness. A synopsis of all seven reports and our assessment of their applicability to DoD is presented in Appendix B.

CII task force studies are narrower in scope and have produced recommendations that, while still general, are more specific than the CICE Project reports. The CII task force recommendations have a much greater potential for DoD implementation; thus, the remainder of this report focuses on them.

CHAPTER 2

IMPLEMENTATION OF CII RECOMMENDATIONS

CURRENT DoD IMPLEMENTATION

The CII task force recommendations can be divided into three categories according to the level of DoD action required. The first category includes recommendations that DoD could implement directly. Examples are ideas on project management, constructibility reviews, and other issues that affect work done directly by DoD in-house workforces or contractors. They are recommendations that appear to be applicable to DoD operations and would improve the DoD construction and design program if adopted by DoD construction agents. The second category includes recommendations that DoD should encourage its contractors to implement. Those recommendations address areas with which DoD is not directly concerned such as the training of supervisors, use of overtime, materials management, etc., but whose improvement could generate indirect benefits to DoD through higher quality or lower cost projects. DoD could realize indirect benefits by endorsing these recommendations and encouraging contractors to adopt them. The third category includes recommendations that are well covered by existing DoD programs or are not appropriate for DoD action. Safety and quality assurance recommendations are examples of the former, and proposed changes to legislation such Davis Bacon Act requirements, the latter.

DoD has actively participated in the CII. It is represented on the board of advisors and is active on many of the CII task forces. Such representation has enabled DoD to influence the selection of topics to be examined by CII and has helped maintain the technical proficiency of DoD task force members. The board of advisors and the task forces also provide DoD with access to industry forums that permit them to test new ideas and keep abreast of industry concerns.

In addition to overall support for CII efforts, DoD needs to evaluate and determine the applicability of recommendations in recently completed CII studies to the DoD construction program. This activity is necessary because of the perception by top level Service construction managers that few of the recommendations made so

far are applicable to DoD. We found that knowledge of the CII studies and recommendations is virtually nonexistent in the Field Operating Agencies of DoD construction agents. Thus, even if good, applicable ideas are developed by CII, they are unlikely to be adopted in a timely fashion.

POTENTIAL DoD BENEFITS

Implementation of some CII recommendations can have direct and indirect benefits. Direct benefits are possible when the recommendations address work performed by DoD personnel. Examples include better evaluation of design contractors and improved construction management. Indirect benefits are possible when the recommendations address contractors' operations. Improved contractor efficiency would, in theory, result in lower construction costs, which over time would translate into lower bids on DoD projects. The CII has estimated that potential cost reductions of 10 percent are readily attainable. DoD benefits would be significant if some of these potential cost reductions could be attained by contractor and passed on to DoD through competitive pressures.

DoD participation in the development of CII recommendations and in their implementation will help maintain the technical proficiency of DoD staff. The exchange of ideas and opinions within the task forces is an ideal way for DoD members to keep abreast of the latest industry developments. Similarly, the implementation of appropriate CII recommendations will help ensure that state-of-the-art techniques are being used by DoD to manage and execute its design and construction program. Another benefit to DoD is the review process itself that takes place when it evaluates the desirability of implementing a CII recommendation. Even if the CII recommendation is not adopted, other beneficial changes are likely to be initiated – changes that would probably not otherwise be made.

Increased implementation of CII recommendations will stimulate DoD participation in CII studies. This, in turn, will help direct future efforts toward issues of DoD concern. Participation also provides a mechanism whereby the work of DoD research laboratories can be infused into the private sector in a technology transfer that works to the benefit of both parties. Maintaining technical proficiency, providing a catalyst for change, and transferring technology are all significant benefits to DoD in terms of staff development, improved operations, and increased private sector capability.

CONCLUSIONS

The strength and productivity of the construction industry is of major concern to DoD. That concern stems from the size of the annual DoD investment in construction and the need to have a healthy construction industry for mobilization. Either of these factors provides adequate motivation for DoD to support the implementation of CII recommendations. DoD, by the sheer size of its construction program, can have a significant impact on the construction industry productivity if it chooses to implement CII recommendations.

DoD needs a strategy for the systematic review and implementation of CII recommendations. Despite the fact that DoD is an active participant in the CII, little information on CII activities or recommendations is being disseminated beyond the Service task force members. This failure to disseminate information is due in part to the perception that CII recommendations are not applicable to DoD operations and the fact that CII reports and recommendations have just begun to be disseminated. This perception is reinforced by the general nature of the recommendations to date. However, despite their general nature, some of the recommendations have applicability to DoD. All have value as catalysts for developing new internal procedures at NAVFAC EFDs, USACE Districts and Divisions, and AFRCEs. We also believe that future CII recommendations will become more structured and will be more adaptable to DoD operations. Effective dissemination of CII information is critical to realizing both current and future benefits.

RECOMMENDATIONS

We recommend that the Director, Quality Facilities Acquisition (QFA), adopt a CII implementation strategy in conjunction with the Services that encompasses the following concepts:

- Require each DoD representative on CII task forces to make a presentation to the Defense Military Construction Panel at the completion of each task force study on the applicability of the recommendations to DoD.
- Require each DoD representative on CII task forces to prepare a two-page synopsis of the task-force recommendations to be sent by the Director, QFA, to the Chiefs of NAVFAC and USACE and the Director of Air Force Engineering and Services Command.

- Arrange for CII publications to be sent directly to NAVFAC EFDs, USACE Districts and Divisions, and AFRCEs.
- Continue supporting efforts to encourage the construction industry to adopt CII recommendations.

The proposed CII implementation strategy is depicted graphically in Figure 3-1 showing both the formal and informal information channels. The proposed strategy will enable DoD to fully realize the potential benefits of current and future CII recommendations. The proposed strategy permits recommendations to be treated at an appropriate level and should prevent DoD from expending effort implementing ideas that are of little consequence to its construction program.

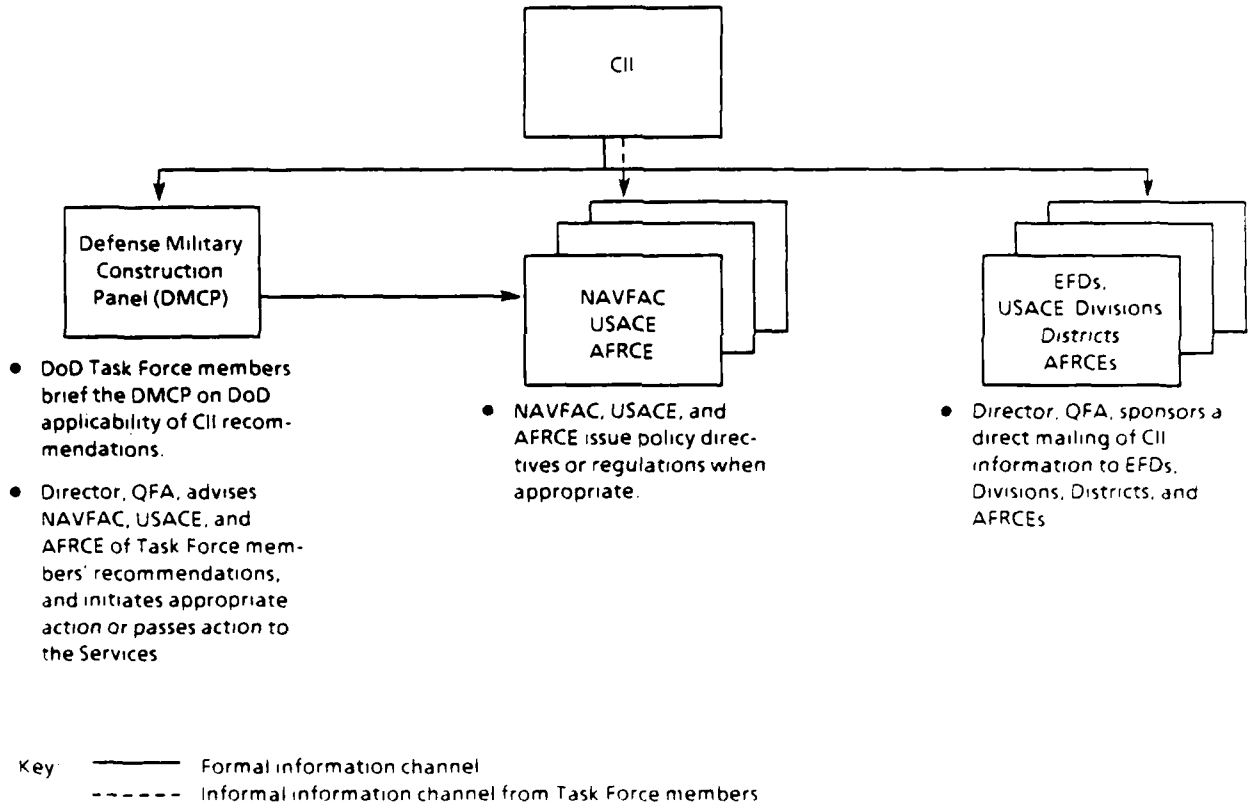

FIG. 3-1. PROPOSED CII IMPLEMENTATION STRATEGY

APPENDIX A

DoD REPRESENTATIVES ON CII TASK FORCES

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Contracts Task Force

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Dr. Paul Thompson HQAFESC/RD, USAF Tyndall AFB, FL 32403 (904) 283-6272	Technology Task Force
Mr. John Ryan Office of the Chief of Engineers DAEN-ECC-G, Room 2214 Washington, DC 20314-1000 (202) 272-8636	Quality Management Task Force
Mr. Dave Spivey Chief, Policy & Planning Division HQ U.S. Army Corps of Engineers Construction Division ATTN: DAEN-ECC-C Washington, DC 20314-1000 (202) 272-0653	Chairman, Project Organization Task Force

APPENDIX B

SYNOPSIS OF CII REPORTS

CONSTRUCTION INDUSTRY INSTITUTE MODEL PLANT (Publication 2-1)

Summary

Publication 2-1 is the first in a series of reports that will provide baseline model projects for several segments of industry. These baselines provide a means for measuring construction productivity or the impacts of constructibility or technological innovation. They can also be useful in selecting contracting strategies and testing cost/schedule alternatives. In addition to the baseline, the report provides a standard method for collecting site productivity data from owners and contractors for analysis and reporting. This first baseline chosen is for a typical petrochemical facility.

The development of model plants provides a mechanism by which various aspects of the construction industry can be tracked and the impact of potential changes estimated. Industry members are encouraged to support development of the model plants and disseminate the results of their operations.

Applicability to DoD

This report has no direct applications for DoD. Future reports may be useful if the industry segments chosen approximate construction for military requirements. Other baselines will probably be developed for other manufacturing industries, office and commercial buildings, electrical power and gas utilities, and communication industries. Their productivity measurement aspect is more useful to the contractor than DoD unless it is somehow incorporated into an award fee determination. The idea of constructibility, contract type, and cost/schedule decision analyses may be of some future use although the complexity of the analyses would restrict them to the largest undertakings. No DoD action is needed on this publication.

CONSTRUCTIBILITY – A PRIMER (Publication 3-1)

Summary

Publication 3-1 defines constructibility as a means to ensure the incorporation of construction considerations into every phase of a project, from feasibility studies, through procurement, into construction. A constructibility program includes a review of construction documents during the design phase to determine more efficient methods of construction and assembly. Paybacks of 15 to 1 have been identified from seven examples on major projects.

Guidance for implementing a constructibility program is also presented. The program must be specific to the user, and contracts must specify the constructibility objectives and the roles of the participants. The study lists seven critical ingredients that must be included in all programs, and they range from communicating senior management's commitment to evaluating progress and results.

The study concludes that constructibility works, often with dramatic results. Although it makes no recommendations, the study announces the future publication of the "Constructibility Concepts File," to provide examples and implementation guidance for constructibility programs.

Applicability to DoD

For a number of years, the Services have required that constructibility reviews be performed. However, the degree to which they are performed is sometimes questioned. Publication 3-1 highlights the benefits of constructibility reviews and would be beneficial for those performing constructibility reviews within DoD. A review of Service constructibility policies should be planned after CII issues the "Constructibility Concepts File" later this year.

IMPACT OF VARIOUS CONSTRUCTION CONTRACT TYPES AND CLAUSES ON PROJECT PERFORMANCE (Publication 5-1)

Summary

Publication 5-1 is a survey of 36 CII member companies, both owners and contractors, on the impact of certain contract clauses. The results were interpreted by task force members. From 96 generic or "boilerplate" contract clauses, they identified the following nine as those which are most frequently the subject of disputes or other complications:

1. Work Scope Definition
2. Supporting/Included Documents
3. Design Changes
4. Construction Changes
5. Definition of Costs
6. Price
7. Cost Reporting and Control
8. Schedule Reporting and Control
9. Design Rework.

The role of incentives was also explored. Negative incentives – penalty and liquidated damages – are more traditional but generally hamper project performance. Positive incentives – award fees – are generally based on cost, quality, safety, and other (sometimes subjective) criteria. Although neither positive nor negative incentives are often employed, some owners reported favorable results with them, and they seem to offer a promising area for further research.

Fixed-price and cost-plus contract types were compared. Clauses covering work scope definition, changes, and project control caused problems with both types. However, only fixed-price contracts created disputes over schedule, quality, and cost reporting and control. Moreover, fixed-price contracts place more risk on the contractor and require more effort during design, whereas cost-plus contracts place the risk on the owner, require more owner resources during construction, accommodate fast-tracking, and result in a less adversarial relationship.

No single type of contract is best suited for all projects. Cost benefits can be realized when risk allocation is tailored to the requirement. Owners who routinely force maximum assumptions of risk on the contractor will incur higher costs. Also, superior project performance is attained with positive contractual incentives.

The following recommendations are made in the publication:

1. Tailor contract language to fit each project; a common understanding of its meaning is vital.
2. Use special care on clauses covering work scope, changes, and project control procedures.
3. Allocate the risk to the party in the best position to manage it. This risk sharing often influences the choice of contract type.
4. Routinely use positive incentives for cost management and consider them for more innovative provisions.
5. Consider more research in improving understanding of risk allocation, developing guidelines for positive incentives, and improving understanding of alternative contracting strategies.

Applicability to DoD

The first three recommendations are simply sound contracting practices, but they can never be overemphasized. Dissemination of this study to Service Field Operating Activities will reiterate their value and encourage their use. Distribution to the various procurement schools and contracting courses will provide excellent reenforcement for teaching these principles. The DoD is already studying the fourth recommendation. The fifth recommendation for more research also directly applies to DoD, and if this research is not soon forthcoming from CII, DoD should consider initiating its own.

PROJECT CONTROL FOR ENGINEERING (Publication 6-1)

Summary

Publication 6-1 provides a formal project control system for the design phase of construction. It is a simplified version of the Cost & Schedule Control Systems Criteria (CSCSC) method used by the DoD and DOE. This abbreviated, computerized system encompasses planning, scheduling, monitoring, reporting and analysis, forecasting, and historical data collection. It also allows subsystems for equipment and instrument lists, procurement activity, and other design needs.

Publication 6-1 offers alternatives for design shop organization (functional, task force, and matrix) and for progress measurement (milestone, units completed, percentage, and judgment), as well as general information on the nature of design work management. It also provides a budget control matrix.

Publication 6-1 concludes that its system is effective for controlling both work and cost and that about 8 percent of a design budget should go to project control. Potential cost and time savings are thought to far outweigh that investment, and design organizations are encouraged to implement control systems similar to those described.

Applicability to DoD

Since the report is based on the DoD CSCSC system, it has little relevance to DoD construction and design managers. It makes the point that the DoD's CSCSC is complicated and too difficult to use for most of the private sector needs. It was designed for high-dollar-value, cost-reimbursable, complex projects. This simplified version might be useful to the DoD for smaller projects. This issue is more related to audit requirements than it is to construction management and the report should be forwarded to the Defense Contract Audit Agency for its information.

SCOPE DEFINITION AND CONTROL (Publication 6-2)

Summary

Poor scope definition at the estimate (budge) stage and loss of control of project scope rank as the most frequent contributors to construction cost overruns. Publication 6-2 explores the reasons for scope definition and scope growth problems and offers solutions. Six main reasons are identified why owners are willing to proceed before projects are fully defined. They range from lack of owner engineering expertise to attempts to economize. By far the greatest reason is market pressure – intense but short-lived demand for the product. Budgets are often finalized too soon. They should not be submitted until the project is estimated to an accuracy of 15 percent, and special attention should be given to bulk material estimates since its installation accounts for 75 percent of field labor costs. Reasons for scope changes are also discussed and nine ways to control them are explained.

The publication examines three factors that have the greatest impacts on scope definition and control: budget estimate accuracy, bulk quantity control, and change management. It concludes that the only way to reduce problems in those areas is to adopt an organized, efficient philosophy for planning and controlling projects. It presents a series of flow diagrams to scope each project phase from idea to detailed engineering.

Applicability to DoD

Although DoD does not have to contend with market pressure, other military-unique pressures tend to rush scope definition and loosen scope control. Similarly, even though military budgeting is somewhat different than that of the private sector, enough parallels exist to make this study very meaningful. It should be given wide dissemination to the engineering and construction communities of the Services.

COSTS AND BENEFITS OF MATERIALS MANAGEMENT SYSTEMS (Publication 7-1)

Summary

A task force of owners, contractors, and academicians have gathered information on the value and cost effectiveness of "total-concept" materials management systems. Two formal research projects – Phase I and Phase II – were conducted jointly by Auburn and Texas A&M Universities.

Phase I established the basic attributes of each of the materials management functions: Project Planning and Communications, Takeoff and Engineering Interface; Vendor Evaluation; Purchasing; Expediting and Transportation; Field Material Control; Warehousing; and Computer Systems.

Phase II examined the costs and benefits of materials systems from 20 recently completed construction projects. These projects comprised a mixture of lump sum and cost-reimbursable types. The most significant benefit is improved labor productivity, where a 6 percent gain can be expected. Other benefits include reduced bulk materials surplus, reduced management manpower, and improved vendor performance. The costs of these benefits range from $25,000 to $500,000 and come mainly from the development of a computer system. Analysis of a hypothetical project showed that even a 6 percent savings in labor costs would more than double the cost of implementing them.

Benefits of a well-planned materials management system exceed the system costs by a margin that cannot be ignored. The 6 percent savings in labor costs should be considered a conservative lower bound.

Applicability to DoD

Most of this study's recommended management practices apply to DoD, and most have already been implemented. For instance, the Services already have extensive computer systems to handle materials, although for firm, fixed-price contracts, these practices would apply only to the contractor. Moreover, proprietary restrictions make it impossible for DoD to specify name brands to take advantage of some of the benefits. Similarly, vendor evaluation and choice is also strictly controlled. Although of limited direct value to DoD, then, Publication 7-1 should nevertheless be distributed for its general advice and reinforcement of good management practices for cost-plus contracts and for its information on how a good contractor runs his material control system.

EVALUATION OF DESIGN EFFECTIVENESS (Publication 8-1)

Summary

Publication 8-1 presents a method for evaluating design effectiveness using an objectives matrix approach. The scores on seven evaluation criteria are multiplied by their weights and the results are totaled to give a numerical performance index. The seven criteria are:

1. Accuracy of design
2. Usability of design documents
3. Cost of design
4. Constructibility
5. Economy of design
6. Performance against schedule
7. Ease of start-up.

Criteria 2, 4, and 5 are not easily quantified and must be subjectively rated. Scoring of each criterion can become complex, and, in fact, submatrices can be used to arrive at each score. The method is flexible and can be tailored to individual needs. However, since the owner may have as great an influence on criteria as the designer, the process is not readily adaptable to the evaluation of designers as opposed to the design itself. Dupont has modified this evaluation system slightly and is implementing it on all of its design work with the objective of offering fee incentives based on performance.

The Design Evaluation Matrix can be used for any project type or area of a project. It can be simple or sophisticated, and it can be used to track performance, including trends, while a design is in progress, thus providing feedback on needed changes. Norms for the criteria and subcriteria should be developed to help quantify the evaluation.

Applicability to DoD

Improving design quality is a worthy goal for any organization. However, before implementing this method, the user must be clear on what is to be done with

the results. This is especially true since total evaluation can only be done when construction is well under way. It may be used, for instance, to provide feedback for in-house training, to evaluate contract architect and engineering (A&E) performance, or to provide limited feedback while design is in progress. Each Field Operating Agency should be given the opportunity to review this method by distribution of the report.

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